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# Abundance and Run Timing of Adult Chum Salmon in the Sturgeon River, Kodiak, Alaska, 1998

Mary A. Faustini



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*Abstract.*—From June 14 to July 20 1998, a flexible picket weir was installed in the Sturgeon River, Kodiak Island. A total of 24,093 chum salmon *Oncorhynchus keta* passed through the weir. The run exhibited two peaks with the first occurring on June 26 (N=2,517) and the second on July 10 (N=5,332). Water temperatures ranged from 5 to 11 °C and averaged 8 °C.

**Introduction**

The Sturgeon River provides important spawning and rearing habitat for chum *Oncorhynchus keta*, pink *O. gorbuscha*, and coho *O. kisutch* salmon, steelhead *O. mykiss*, and Dolly Varden *Salvelinus malma*. In the Kodiak Archipelago, Sturgeon River chum salmon exhibit unique run timing, entering the lagoon in early to mid-June compared to other Kodiak chum salmon stocks which enter the rivers in mid-to-late July (Chatto 1998). These early chum salmon provide a valuable protein food source for large concentrations of brown bear and bald eagles that congregate within the river corridor. The Sturgeon River was identified as one of 10 special values for the Kodiak National Wildlife Refuge (Refuge) in it's Comprehensive Conservation Plan (U.S. Fish and Wildlife Service 1987).

Previous data on Sturgeon River chum salmon consists of aerial escapement index surveys of the river and lagoon conducted by the Alaska Department of Fish and Game (Department) and the Refuge (Appendix 1), and a chum salmon spawning habitat study by the Refuge (Chatto 1998). The Department indexed escapement goal for chum salmon ranges from 50,000-150,000 (Brennan et al. 1997), but this goal is currently proposed to be reduced to 25,000-75,000 (Kevin Brennan, Alaska Department of Fish and Game, personal communication), and the refuge escapement goal recommendation is 27,000-42,600 (Chatto 1998). Since 1985, the annual chum salmon escapement index in the Sturgeon River and lagoon appears to have declined and become more variable compared to data collected in the late 1970's and early 1980's. Even using the reduced escapement goals, between 1993 and 1998, Sturgeon River chum salmon have met the minimum escapement goal only twice (1994 and 1995). The estimated escapements for 1996-1998 have been the lowest on record. Aerial surveys in general are highly variable and are only an index of relative strength of salmon runs. Aerial surveys of the Sturgeon River are complicated since estimates are a composite of both in-river and lagoon counts. During some years (1989, 1993, 1994), salmon observed in the lagoon were not seen in subsequent in-river surveys (Chatto 1998).

The decline of Sturgeon River chum salmon and the variability of aerial surveys is of concern to the Refuge. Not only is this a unique population and an important component of the ecosystem, but Section 303 (5)(b) of the Alaska National Interest Lands Conservation Act (ANILCA) specifically mandates that the Refuge shall be managed to conserve fish and wildlife populations and habitats in their natural diversity. Reliable data on salmon stocks originating on the Refuge is required to ensure compliance with ANILCA. To that end, the U.S. Fish and Wildlife Service initiated a weir project in 1998 to provide more accurate escapement data than has been available. The specific goals are to: (1) enumerate adult chum salmon; and (2) describe timing of chum salmon returns.

### Study Area

The 170 km<sup>2</sup> Sturgeon River drainage is located on the west side of Kodiak Island. The mainstem Sturgeon River flows from its headwaters in the Refuge for approximately 28.3 km to Sturgeon Lagoon. The south fork tributary of the Sturgeon River flows for approximately 8.2 km prior to joining the mainstem 12.8 km above the lagoon (Figure 1). The lower 21 km of the mainstem and 2.6 km of the south fork are located on native conveyed lands administered by Koniag Inc.

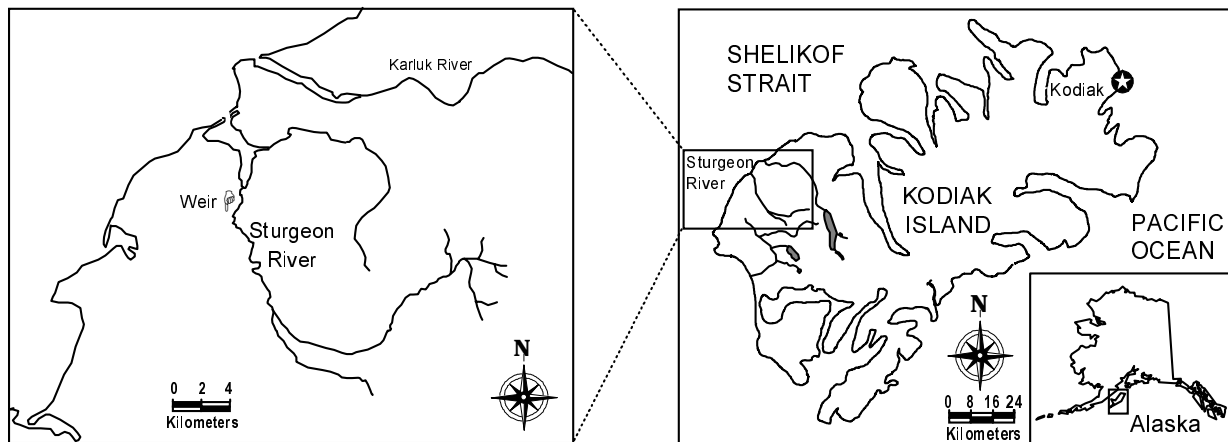


FIGURE 1.—Weir location in the Sturgeon River, Kodiak, Alaska, 1998.

The Sturgeon River drainage is within the maritime zone with climatic conditions influenced by the warm Japanese current which flows along the Gulf of Alaska. Overall mean annual temperature is 4° C. Average summer and winter temperatures are about 10° C and -2° C, respectively. Stream flow is characterized by peak flows during late May and early June in response to snowmelt. Rainstorms may produce secondary peaks in summer (U.S. Fish and Wildlife Service 1990).

The weir site is approximately 2.5 km upriver from the Sturgeon Lagoon. This section of the river is straight and unbraided. Average depth is approximately 0.5 m. Substrate at the weir site predominantly ranges from medium gravel (25-50 mm) to small cobble (75-150 mm).



## Methods

### *Weir Operation and Physical Data*

A flexible picket weir spanning 40 m was installed and operated from June 14 to July 20, 1998. The weir was patterned after a design used on the Alaska Peninsula (Nick Hetrick, U.S. Fish and Wildlife Service, personal communication). Weir pickets are schedule 40 polyvinyl chloride electrical conduit with a 2.5 cm inside diameter. The space between individual pickets is 3.4 cm. Pickets are 1.5 m long and strung together with 3 mm aircraft cable to make panels 3 m long (Appendix 2). A spanning cable (6 mm aircraft) was strung bank to bank and pulled tight about 0.3 m above the surface of the water. The weir panels were leaned against the cable and supported with fenceposts (Appendix 3).

All fish were enumerated to species as they passed through gaps created between panels. Fish were passed and counted intermittently between 0800 and 2300 hours each day. The duration of counting sessions varied depending on the intensity of fish passage through the weir and were recorded to the nearest 0.25 hour.

The weir was inspected daily for holes and structural integrity. Fish carcasses and debris were cleaned from the weir as they accumulated.

A staff gauge was installed 100 m downstream of the weir to measure daily water levels. Water temperatures were collected between 0800 and 1000 hours.

## Results

### *Weir Operation and Physical Data*

The weir was functional throughout the operational period. No holes were reported, water levels did not exceed the height of the weir, and no salmon were observed escaping through the pickets.

Stage heights ranged from 18 to 67 cm and averaged 41 cm (Appendix 4). Water temperatures ranged from 5 to 11 °C and averaged 8 °C (Appendix 4).

### *Chum Salmon Escapement*

During project operations, 24,093 chum salmon passed through the weir from June 14 to July 20 (Figure 2), with the initial five chum salmon passed on June 16. The run exhibited two peaks with the first occurring on June 26 ( $N=2,517$ ) and the second on July 10 ( $N=5,332$ ).

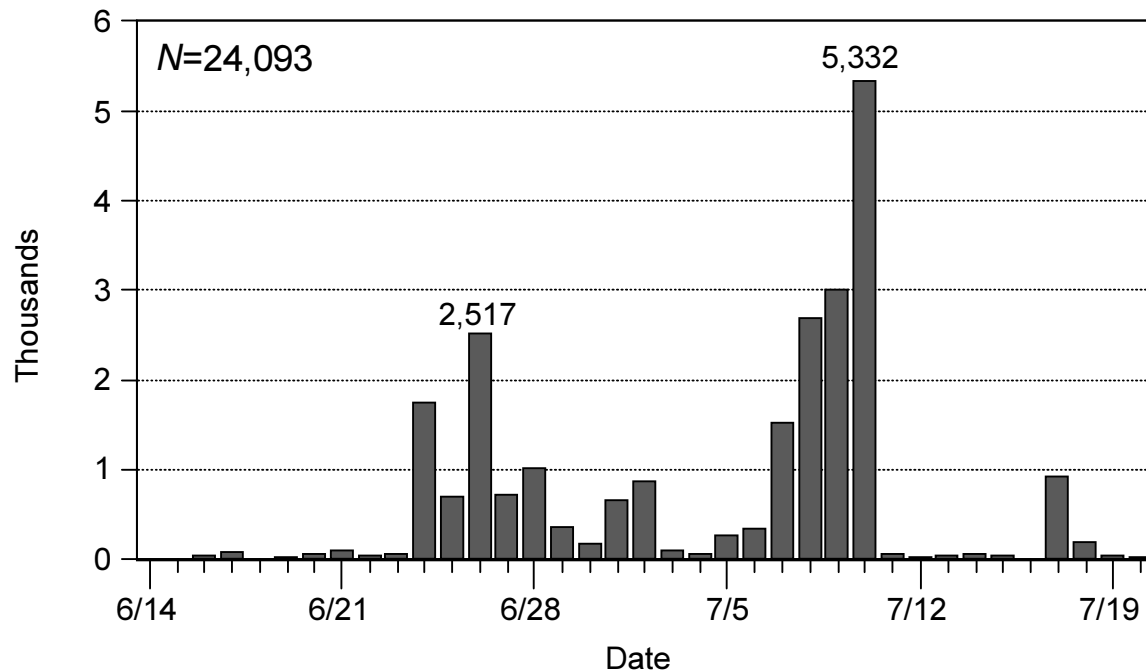


FIGURE 2.—Chum salmon escapement through the Sturgeon River weir, Kodiak, Alaska, 1998.

## Discussion

### *Weir Operation and Physical Data*

The weir was an effective method for counting chum salmon returning to the Sturgeon River. This weir style was chosen for its portability and cost effectiveness. The weir was originally scheduled for installation in late May to enumerate steelhead outmigrants. Unusually high water levels caused by abundant rain prevented the weir from being installed until June 14. Because no fish were observed staging in the lagoon and river, and few chum salmon were counted through the weir until June 24, I concluded that the weir was installed in time to count the start of the salmon run. Even after water levels dropped enough to permit installation, water velocities at the weir site remained high, and were at the upper operational limit for this type of portable weir. Average water velocities immediately upstream of the weir were 0.8 to 0.9 mps, and often reached 1.2 mps in the thalweg. This type of weir is relatively lightweight and easily transported to remote locations, but is not as robust as picket weirs supported by tripods, or resistance board weirs. Also, since this type of weir has no catwalk, water depth and velocity must be in a range where crew members can safely access and service the weir by wading.

## **Acknowledgments**

Many people contributed to this project. Appreciation is extended to Mike Cavin and Gus Johnson who built the weir; Mike Cavin for helping set up base camp; Sharon Delsack who executed pre-field logistics and was the crew leader; and Gayle Neufeld, Cliff Schluesner and Martin Ide for staffing the weir.

Thanks to the entire Kodiak National Wildlife Refuge staff for their generous support. Nearly every member of the staff helped the project during some phase of planning, construction, and operations. Special thanks goes to Tony Chatto for his help with project planning and logistical support, without which this project would not have happened.

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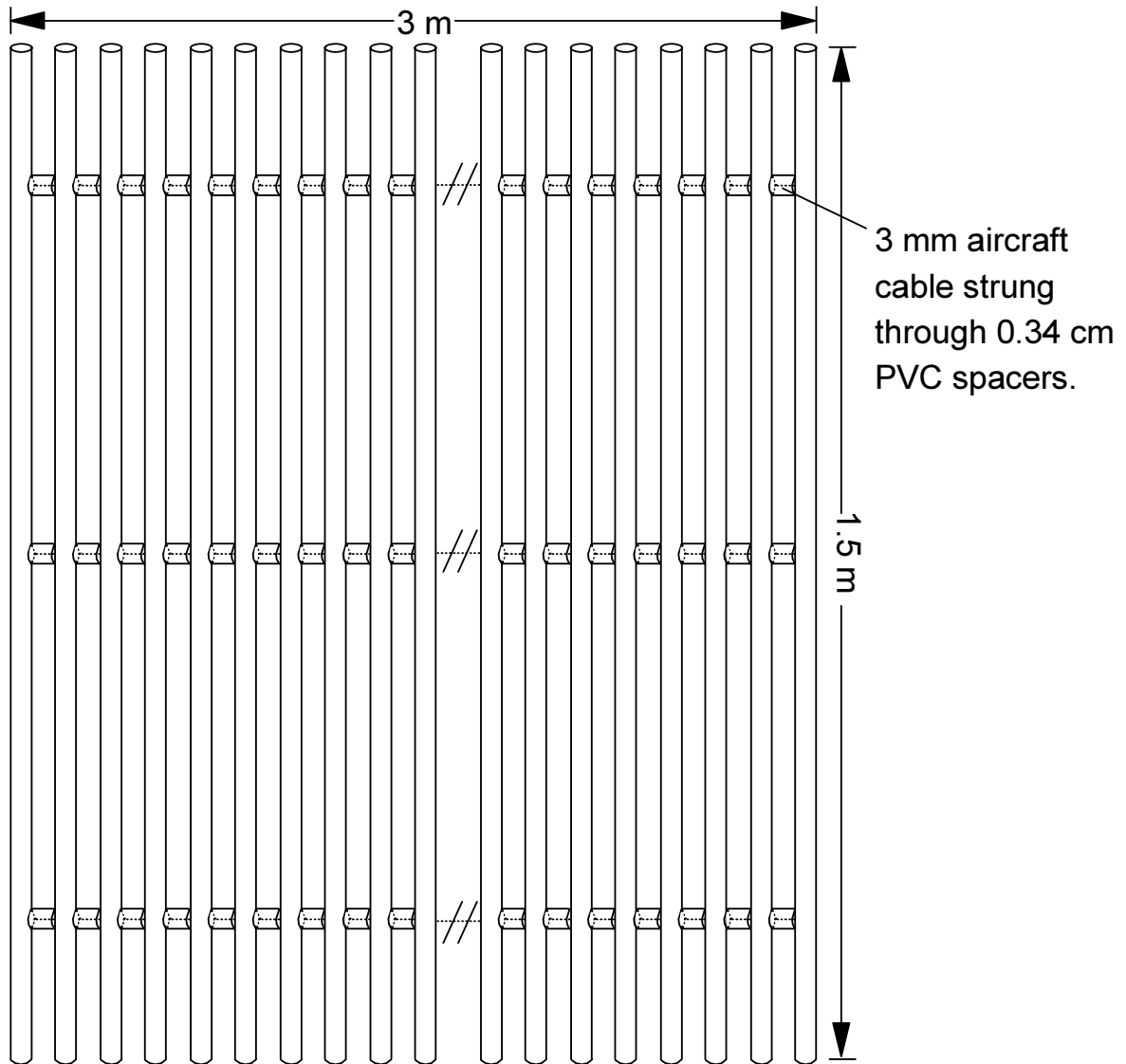
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Appendix 1.—Sturgeon River drainage peak chum salmon aerial index escapement counts for the lagoon and in-stream, and peak indexed brown bear streamside counts for the years 1976-1998. Data for years 1976-1997 were compiled by Chatto (1998).

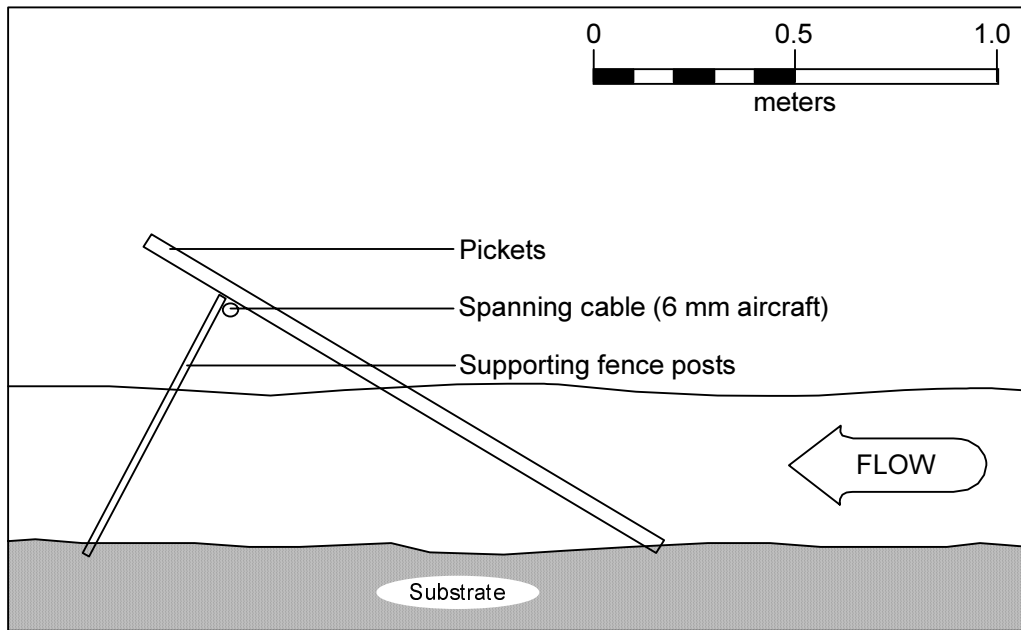
Year	Peak Aerial Index Counts, Chum <sup>a</sup>		Peak Aerial Index Counts, Bear <sup>b</sup>
	In-stream	Lagoon	Streamside
1976	45,000	0	16
1977	95,000	0	3
1978	57,000	0	19
1979	151,000	0	10
1980	9,000	35,000	19
1981	88,000	0	14
1982	85,000	0	31
1983	74,000	500	NS
1984	80,000	0	36
1985	15,000	4,000	42
1986	86,000	0	28
1987	1,000	15,000	17
1988	53,200	5,500	19
1989	5,000	30,000	21
1990	79,000	0	23
1991	22,500	25,000	38
1992	41,000	8,500	25
1993	1,300	12,500	11
1994	10,000	70,000	20
1995	23,000	9,200	36
1996	6,820	1,800	9
1997	3,600	5,500	2
1998	4,100	0	39

<sup>a</sup> Data source: Alaska Department of Fish and Game, Kodiak Area Management files.

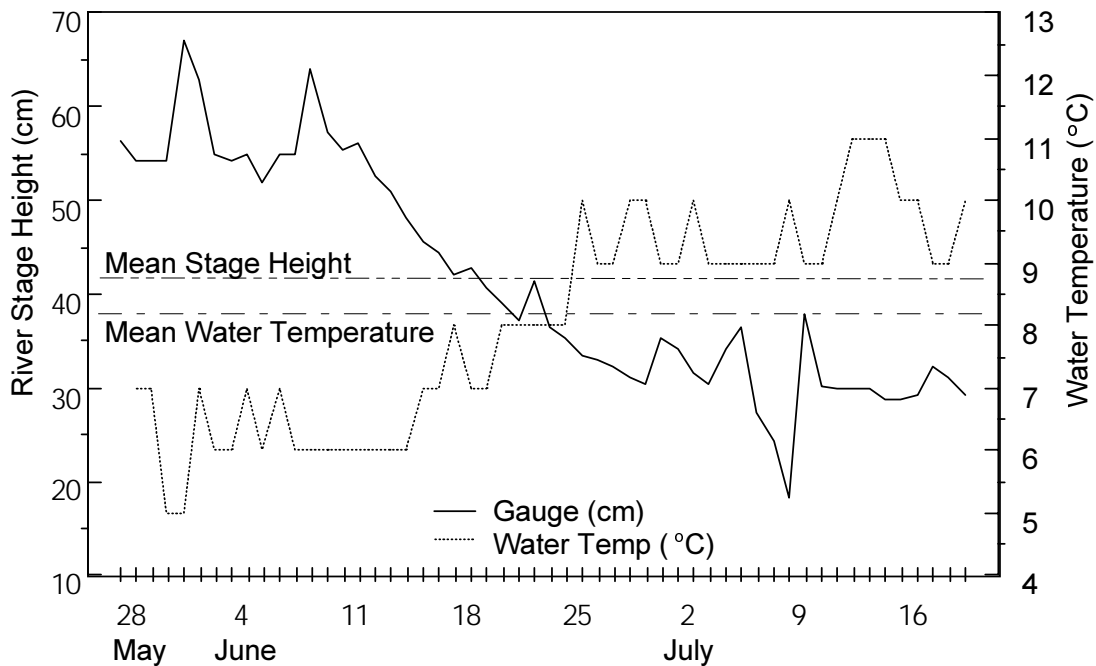
<sup>b</sup> Data source: U.S. Fish and Wildlife Service, Kodiak National Wildlife Refuge files.



Appendix 2.—Weir panel with pickets constructed from schedule 40 polyvinyl chloride (PVC) electrical conduit with a 3.3 cm outside diameter and strung together with 3 mm aircraft cable.



Appendix 3.—Lateral view of an installed weir panel. Spanning cable is anchored to both banks and pulled tight so it does not sag into the water. Fence posts support the cable so the weight of the weir does not cause the panels to submerge.



Appendix 4.—River stage heights and water temperatures at the Sturgeon River weir, Kodiak, Alaska, 1998.